|  |
| --- |
|  |

Lesson 26: Triangle Congruency Proofs—Part I

**Student Outcomes**

* Students complete proofs requiring a synthesis of the skills learned in the last four lessons.

Classwork



1. Given: $\overbar{AB}⊥\overbar{BC}, \overbar{BC}⊥\overbar{DC}$.

 $\overbar{DB}$ bisects $∠ABC$, $\overbar{AC}$ bisects $∠DCB.$

 $\overbar{EB}⋍\overbar{EC}.$

Prove: $△BEA≅△CED.$

$\overbar{AB}⊥\overbar{BC}$, $\overbar{BC}⊥\overbar{DC}$ Given

$m∠ABC=90˚$, $m∠DCB=90˚$ Def. of perpendicular

$\overbar{DB}$ bisects $∠ABC$, $\overbar{AC}$ bisects $∠DCB$ Given

$m∠ABE=45˚$, $m∠DCE=45˚$ Def. of bisect

$m∠ABE=m∠DCE$ Transitive Property of = (Substitution)

$∠ABE⋍∠DCE$ Def. of congruent angles

$\overbar{EB}⋍\overbar{EC}.$ Given

$∠AEB and ∠DEC$ are vertical angles Definition of Vert. $∠s$

$∠AEB ⋍∠DEC$ Vert. $∠$ Theorem

$△BEA≅△CED$ ASA



1. Given: $\overbar{XJ}⋍\overbar{YK}, \overbar{PX}⋍\overbar{PY}, ∠ZXJ⋍∠ZYK. $

Prove: $\overbar{JY}=\overbar{KX}$.

$\overbar{XJ}⋍\overbar{YK}, \overbar{PX}⋍\overbar{PY}, ∠ZXJ⋍∠ZYK.$ Given

$∠JZX and ∠KZY$are vertical angles Definition of Vert. $∠s$

$∠JZX⋍∠KZY$ Vert. $∠ Theorem$

$△JZX≅△KZY$ SAA (AAS)

$∠J⋍∠K$ Corresponding Parts of Congruent Triangles are Congruent (CPCTC)

$∠P⋍∠P$ Reflexive Property

$\overbar{JP}⋍\overbar{PK}$ When congruent segments are added to congruent segments, the sums are conguent

$△PJY≅△PKX$ SAA

$\overbar{JY}=\overbar{KX}$ CPCTC



1. Given: $\overbar{JK}⋍\overbar{JL}, \overbar{JK}∥\overbar{XY}.$

Prove: $\overbar{XY}⋍\overbar{XL}.$

$\overbar{JK}⋍\overbar{JL}$ Given

$∠K⋍∠L $ Base $∠s $in isos. $△$are congruent

$\overbar{JK}∥\overbar{XY}$ Given

$∠K⋍∠Y $ Corr. $∠s$ are congruent since $\overbar{JK}∥\overbar{XY}$

$∠Y⋍∠L$ Substitution/Transitive

$\overbar{XY}⋍\overbar{XL}$ Base $∠s$ converse

1. Given: $∠1⋍∠2, ∠3⋍∠4.$

Prove: $\overbar{AC}⋍\overbar{BD}$.

$∠1⋍∠2$ Given

$\overbar{BE}⋍\overbar{CE}$ Base $∠s$ converse

$∠3⋍∠4$ Given

$∠AEB and ∠DEC$ are vertical angles Definition of Vert. $∠s$

$∠AEB⋍∠DEC$ Vert. $∠s$ Theorem

$△ABC≅ △DCB$ ASA

$∠A⋍∠D$ CPCTC

$\overbar{BC}⋍\overbar{BC}$ Reflexive Property

$△ABC≅ △DCB$ SAA

$\overbar{AC}⋍\overbar{BD}$ CPCTC

OR

$∠1⋍∠2$ Given

$\overbar{BE}⋍\overbar{CE}$ Base $∠s$ converse

$∠3⋍∠4$ Given

$∠AEB and ∠DEC$ are vertical angles Definition of Vert. $∠s$

$∠AEB⋍∠DEC$ Vert. $∠s$ Theorem

$△ABC≅ △DCB$ ASA

$\overbar{AE}⋍\overbar{ED}$ CPCTC

$\overbar{AC}⋍\overbar{BD}$ If congruent segments are added to congruent segments, then their sums are congruent

1. Given: $\overbar{AB}≅\overbar{AC},$

 $\overbar{RB}≅\overbar{RC},$

Prove: $\overbar{SB}≅\overbar{SC}.$

$\overbar{AB}≅\overbar{AC}$, $\overbar{RB}≅\overbar{RC}$ Given

$\overbar{AR}≅\overbar{AR}$ Reflexive Property

$△ARC≅△ARB$ SSS

$∠ARC≅∠ARB$ CPCTC

$∠ARC and ∠SRC$ form a linear pair Definition of a linear pair

$∠ARB and ∠SRB$ form a linear pair

$∠ARC and ∠SRC$ are supplementary Linear Pair Theorem

$∠ARB and ∠SRB$ are supplementary

$∠SRC≅∠SRB$ supplements of congruent angles are congruent

$\overbar{SR}=\overbar{SR}$ Reflexive Property

$△SRB≅△SRC$ SAS

$\overbar{SB}≅\overbar{SC}$ CPCTC

1. Given: $\overbar{JK}≅\overbar{JL}, \overbar{JX}≅\overbar{JY}.$

Prove: $KX=LY$.

$\overbar{JX}≅\overbar{JY}$ Given

$∠JXY≅∠JYX$ Isosceles Triangle Theorem

$∠JXK and ∠JXY$ form a linear pair Definition of Linear Pair

 $∠JYL and ∠JYX$ form a linear pair

$∠JXK and ∠JXY$ are supplementary Linear Pair Theorem

 $∠JYL and ∠JYX$ are supplementary

$∠JXK≅∠JYL$ Supplements to congruent angles are congruent

$\overbar{JK}≅\overbar{JL}$ Given

$∠K≅∠L $ Isosceles Triangle Theorem

$△JXK≅△JYL$ SAA

$\overbar{KX}≅\overbar{LY}$ CPCTC

1. Given: $\overbar{AD}⊥\overbar{DR}, \overbar{AB}⊥\overbar{BR}$,

 $\overbar{AD}≅\overbar{AB}.$

Prove: $∠DCR≅∠BCR.$

$\overbar{AD}⊥\overbar{DR}, \overbar{AB}⊥\overbar{BR}$, Given

$∠ADR and ∠ABR are right angles$ Definition of perpendicular lines

$△ADR and △ABR are right triangles$ Definition of right triangle

$\overbar{AD}≅\overbar{AB}$ (Leg) Given

$\overbar{AR}≅\overbar{AR}$ (Hypotenuse) Reflexive Property

$△ADR≅△ABR$ Hypotenuse Leg (HL)

$∠ARD≅∠ARB$ Corr. $∠$s of $≅△$ (CPCFC/CPCTC) $∠ARD and ∠DRC are a Linear Pair Definition of Linear Pair $

$∠ARB and ∠BRC are a Linear Pair$ $∠ARD and ∠DRC are Supplementary Linear Pair Theorem$

$∠ARB and ∠BRC are Supplementary$

$∠DRC≅∠BRC$ Supplements of congruent angles are congruent

$\overbar{DR}≅\overbar{BR}$ Corr. sides of $≅△$ (CPCFC)

$\overbar{RC}≅\overbar{RC}$ Reflexive Property

$△DRC≅△BRC$ SAS

$∠DCR≅∠BCR$ Corr. $∠$s of $≅△$ (CPCFC)

1. Given: $\overbar{AR}≅\overbar{AS}, \overbar{BR}≅\overbar{CS},$

 $\overbar{RX}⊥\overbar{AB}, \overbar{SY}⊥\overbar{AC}.$

Prove: $\overbar{BX}≅\overbar{CY}.$

$\overbar{AR}≅\overbar{AS}$ (S) Given

$∠ARS≅∠ASR$ Base $∠$s of isos. $△ ≅(ITT)$

$∠ARS and ∠ARB$ are a Linear Pair $Def. of a Linear Pair$

$∠ASR and ∠ASC are a Linear Pair$

$∠ARS and ∠ARB$ are Supplementary $Linear Pair Theorem$

$∠ASR and ∠ASC are Supplementary$

$∠ARB≅∠ASC$ (A) Supplements of congruent angles are congruent

$\overbar{BR}≅\overbar{CS}$ (S) Given

$△ARB≅△ASC$ SAS

$∠ABR≅∠ACS$ (A) Corr. $∠$s of $≅△$ (CPCFC/CPCTC)

$\overbar{RX}⊥\overbar{AB}, \overbar{SY}⊥\overbar{AC}$ Given

$∠RXB and ∠SYC$ are right angles Def. of perpendicular

$∠RXB≅∠SYC$ (A) If two angles are right angles then they are congruent

$△BRX≅△SYC$ SAA

$\overbar{BX}≅\overbar{CY}$ Corr. sides of $≅△$ (CPCFC)